

# Silgen Ag – an evaluation of a novel silver application

There are many silver products on the market today, which can make it difficult for healthcare providers to decide which ones to purchase. A new class 3 product, Silver Ag has been launched and become available, which promises to provide excellent antimicrobial protection/treatment as well as being cost effective. This silver spray is an alternative to the other antimicrobial products and can be added to the treatment when needed, thus reducing the use of antibiotics and meeting the needs expected with antiseptic stewardship (Roberts, 2017). The product is supplied in 5 ml, 10 ml and 100 ml bottles, for either single dose or multiple doses, to support ease of use and storage, and can be used for up to 8 weeks once opened. A cost analysis has shown that reductions in cost can be achieved by simply incorporating the spray into daily routine when required. The simple use also allows for patient self-care, if appropriate. As with all silver products regular assessment should be performed following the two-week evaluation recommended in the International Consensus document (Wounds International, 2012). This article will look at the product, its adaptability and ease of use whilst giving feedback/comments from clinicians, highlighting some of the uses in case studies.

## KEY WORDS

- » Antimicrobial
- » Evaluation
- » Innovation
- » Silver

Silver, number 47 on the periodic table of elements and symbolised Ag, has been used for its medical properties since records began. Hippocrates, a Greek physician, used silver as a wound cleaner, while the Romans used silver vessels to purify and carry water, as well as recording the use of silver nitrate as early as 69BC (Westly, 2009).

In the 1800s, Dr J Marion Sims used silver wire to suture vesico-vaginal fistulas in women, who had a deformed pelvis, following birth to prevent infections in their wounds from tearing/trauma. Before the development of antibiotics in the 1940s, silver was commonly used for its antimicrobial properties. Following the discovery of antibiotics, silver slid into the background in clinical practice. However, some people still sought its health-giving properties by drinking colloidal silver, believing it made them healthier and helped combat diseases such as the flu.

In the 1950s, creams such as Flamazine™ (Smith and Nephew) began to surface for use in burns. The silver contained in it needed a carrier,

sulfadiazine, in order to break down the cell walls to have any effect on bacterial cells. This product is still in use today but causes staining and maceration and has to be applied daily to maintain the amounts of silver needed into the wound bed to sustain the action of the silver (Dowsett, 2004).

Many modern dressings use a carrier for the silver to be effective, which can be seen in alginates, foams, creams, ointments and membranes. Some work within the dressing, others donate small amounts of silver to the wound. These dressings can be expensive and securing their supply, if not used frequently, can be difficult — particularly when working in the community.

With newly emerging technology that allowed attachment of silver to dressing materials, nanocrystalline silver was developed. Professor Burrell (2003) found that larger amounts of silver could be made available within the wound bed without a carrier. This enabled the silver to break down bacterial cell walls, enter the

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**Table 1. Mean (*n*=4) Log reduction at various time intervals for six species of bacteria and one yeast (*n*=3)**

Organism	5 min	1 hour	4 hours
<i>Pseudomonas aeruginosa</i>	1.13	2.59	>4.52
<i>Klebsiella pneumoniae</i>	1.95	2.56	>5.25
<i>Escherichia coli</i>	0.46	0.63	2.59
<i>Staphylococcus epidermidis</i>	2.47	>4.27	>4.79
<i>Staphylococcus aureus</i>	0.74	1.13	1.59
<i>Enterococcus faecalis</i>	1.66	1.71	1.79
<i>Candida albicans</i>	0.59	1.38	2.08

cell and destroy the bacterial cells — causing certain death as Roberts (2017) highlights. Dead cells cannot lead to resistance, so it is essential that the dressings used provide enough silver to kill bacterial cells. This is estimated at between 20ppm and 40ppm. Nanocrystalline, at this concentration, became very effective when used in the fight against bacterial contamination/infection within wound care (Roberts, 2017). However, the dressing can cause black staining of the tissue within the wound bed. Some practitioners believe this to be localised staining or argyria, but Burrell

(2003) explains that the staining is caused by non-viable cells that have been destroyed by the silver.

One of the problems encountered with some silver dressings, i.e. silver-impregnated foams, is that they do not come into contact with all of the wound bed and this creates an uneven spread leaving areas devoid of any silver. By using a pump spray, where each application delivers a uniform dose giving complete coverage, the efficacy of the silver is optimised. Silgen Ag, a silver spray, was developed by Genadyne Biotechnologies USA and consists of ultrapure water with dextrose and 30ppm elemental silver (CE marked 2017). Silgen Ag is classified as Class 3, so it can be sprayed into cavities and sinuses and any accessible areas of undermining, i.e. areas that cannot be easily visualised without the risk of leaving dressing residual behind. Recommended distance to spray is 10cm away from wound to prevent contamination with two direct sprays to a 7 cm × 7 cm wound.

Microbiological testing by Professor Valerie Edwards Jones highlighted the effectiveness of the Silgen Ag within a 5-minute period, testing was then continued for 24 hours (Table 1). It shows the speed of silver released and speed of bacterial cell being killed, meeting the requirements of the stewardship previously mentioned (Roberts, 2017). The product is developed in such a way, that there is no separation of the silver from the water, and the solution is stable in temperatures ranging from -40°C to +40°C.

**EVALUATIONS**

Multicentre evaluations were conducted in three sites in UK, as well as in Kuala Lumpur, Oman, Costa Rica and Panama. Each site followed their own protocols and local guidelines regarding the use of antimicrobials but used a generic data collection form to gather demographic information and wound specific information. Leaflets were given to all participants and consent obtained for use of the product and taking of photographs.

**CASE STUDY 1**

**Scald /Burn**

A 70-year-old male with scald/burn to foot of 11 day duration (Figure 1a). Extensive comorbidities, including currently undergoing chemotherapy

**Figure 1.**  
**(a) Patient presenting with with a 11-day-old wound — a scald caused by hot water.**  
**(b) Wound has healed after 11 days of treatment with Silgen Ag. The treatment was discontinued and the patient was advised to moisturised**



for metastatic cancer. He was treated with Silgen Ag and a simple topical dressing and oral antibiotics of flucloxacillin 500mg, three time daily for 5 days, original wound size 7 cm × 8cm which healed within three weeks (*Figure 1b*). The patient did not experience any stinging or pain during the application or duration of the Silver spray. The spray was used on alternate days with water used as a cleaner during each dressing change. The photos were taken at the beginning of treatment with Silgen Ag and 11 days later. During the treatment, Professor Jeffrey used new technology where bacterial concentration is seen through new developing camera lens and light technology (MolecuLight i:X™, Smith and Nephew). The camera uses the principles of fluorescence, emitting safe violet light that causes bacteria to be seen. This helps to locate potential levels of harmful bacteria instantly.

**CASE STUDY 2**  
**Venous leg ulcer**

50-year-old female, with a 6-month-old history of a venous leg ulcer with surrounding cellulitis, recurrence seen three time this year, currently treated with four-layer compression bandaging and simple non-adherent dressings (*Figure 2a*). *Pseudomonas aeruginosa* was present on commencement of silver spray, with wound swabbing confirmed. The wound measured 3 cm × 5.5 cm at the start of treatment with the

silver spray. Treatment consisted of Silgen Ag, simple non-adherent dressing and four-layer compression was continued on a twice weekly basis for the duration of treatment time which was 19 days. Measurements on day 19 (*Figure 2b*) showed a wound reduction, with the wound now measuring 3 cm × 3.5 cm. At this point Silgen Ag was discontinued as the clinical signs of infection had resolved and Silgen Ag was no longer required. Treatment continued with a simple non-adherent dressing and compression bandaging.

**CASE STUDY 3**  
**Radiation burns**

54-year-old smoker with multiple sclerosis had right breast lumpectomy in January 2017 for breast cancer. She underwent four sessions of chemotherapy over 8 weeks, followed by 16 radiotherapy sessions over 6 weeks. Afterwards, she developed radiation burns affecting the whole breast and armpit (*Figure 3a and b*).

Standard treatment of Flamazine was used for 2 weeks with no obvious signs of improvement. Silgen Ag was used daily to the skin and 2 days later the patient reported full resolution of the pain and full resolution of the erythema. The patient continued to use Silgen Ag for a further 2 more days just to make sure it had fully resolved (*Figure 3c and 3d*).

**CLINICIANS' FEEDBACK**

The verbal feedback from the healthcare professionals is very encouraging. Below are some of the comments received:

SLA Jeffery, Professor of Wound Study at Birmingham University Hospitals NHS Foundation, stated: "Silver is one of the most potent topical antimicrobial agents available to treat wounds. Now we have the freedom to use it with which ever dressing we want"

Cristina Quintana and Lasso Haydee, Clinica de Curaciones de Heridas. Ulceras y pie Diabetico, Panama City, Panama, gave similar comments: "We had never used silver widely before in wound care and were nervous initially, however, this was overcome very quickly as the wounds improved and we saw the patient's quality of life improving".

Figure 2. (a) Chronic leg ulcer shows ulcer with confirmed swab of *Pseudomonas aeruginosa*. (b) Wound 19 days later. Swab confirmed no *Pseudomonas aeruginosa*. Wound healing is progressing

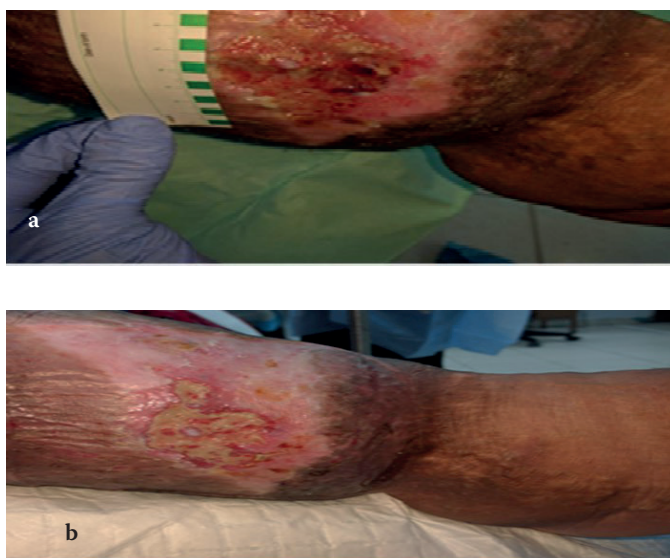




Figure 3. (a, b) Patient presenting with radiation burns affecting the whole breast and armpit. (c, d) The radiation burns have healed after 3 days of treatment with Silgen Ag

While Duncan Drury, Vascular Surgeon Doncaster and Bassetlaw Teaching Hospitals Foundation Trust, states: *“As no staining was seen we had a clearer view of the wound at each review”*.

Rasheeda Salim, Independent Wound Care Specialist Nurse, Oman states: *“The spray is easy to apply and store especially in the extreme heat we have”*.

Vascular Surgeon Harikishna Ragavan Nair, Founding President of the Malaysian Society of Wound Care Professionals, stated: *“Today with the pressure on providing quality care and keeping costs low this has enabled us to increase our use of antimicrobial spray without changing our treatment plans”*.

### CONCLUSIONS AND FURTHER DEVELOPMENTS

While the authors acknowledge there is no one dressing for every wound, this novel spray is a useful addition to the current portfolio of products, which hopefully will aid in reducing the need for antibiotic usage. It gives users the option to continue to use the dressings currently on their formulary, whilst adding in some antibacterial treatment when needed.

As with all antimicrobials, the authors would recommend, that following a full assessment, the two-week challenge is used to evaluate the efficacy of the product and, following full assessment, either continued or discontinued.

The advantage with this product is that there is no necessity to change the secondary dressing either during the evaluation period or after, therefore, reducing the risk of allergies to a new dressing.

The longevity action of the silver has been tested up to 24 hours by Professor Val Edwards Jones but it is hoped that longer action testing will be performed that will enable the product to be used twice weekly rather than daily/alternate days as is required at the moment. Professor Edward-Jones is also looking at the effect of Silgen Ag on biofilm activity.

Silgen Ag, while not being the heaviest donating silver product, is a useful new tool in the field of wound care. Further evaluations are ongoing in Germany, Holland, South Africa and Spain but there is no published data available at present.

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